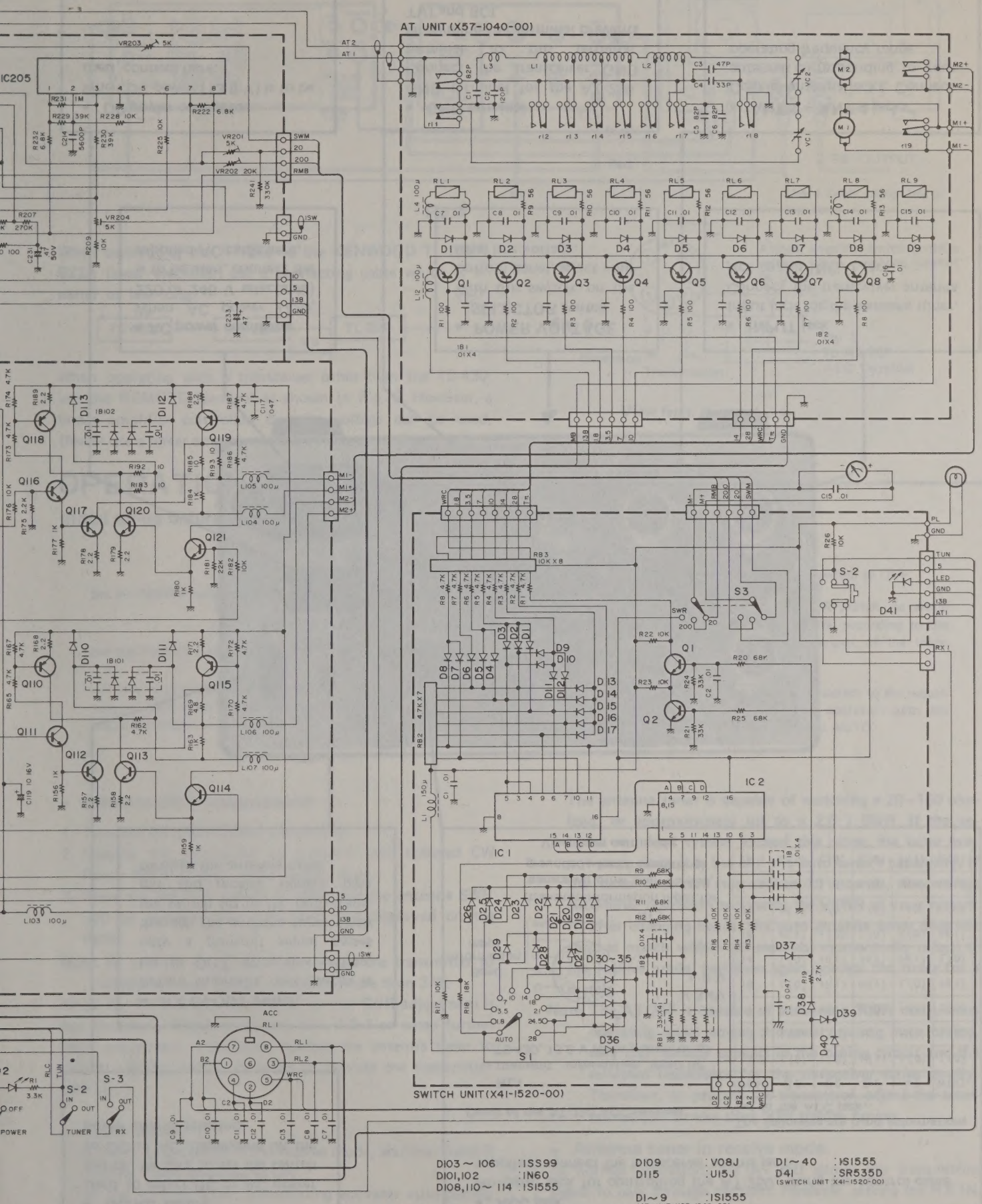
Circuit may be subject to change without notice for improvement.



SPECIFICATIONS

1.	**Frequency range**	All amateur bands from 1.8 – 29.7 MHz
2.	**Input impedance**	50 ohms unbalanced
3.	**Output impedance**	20 – 150 ohms unbalanced
4.	**Insertion loss**	0.8 dB or less
5.	**Pass through power**	100W (200W PEP)
6.	**SWR value for motor stop**	1.2:1 or less
7.	**Min. power for activation**	3W
8.	**Max. tuning time**	Within 15 seconds
9.	**Power meter (peak value reading)**	± 10% at 100W (Meter Switch 200W Position) ± 10% at 10W (Meter Switch 20W Position)
10.	**Power consumption (current)**	15W AC 13.8V DC 600 mA
11.	**Power requirement**	120V, 220V, or 240V AC selectable 13.8V (12–16) DC
12.	**Dimensions**	W174*(174) x H96 (107) x D257 (289) mm ( ) shows projections included.
	Weight	4.2 kg (9.24 lb.)
13.	**Package dimensions**	W385 x H167 x D264 mm Capacitance: 0.017 m^3
14.	**Semiconductors**	ICs 13 FETs 2 Transistors 31 Diodes 77

ACCESSORIES

Remote cable (A) 1
Remote cable (B) 1
AC power cable 1
Grounding wire 1
Instruction manual 1

Specifications may be subject to change without notice for technical improvement.

TRIO-KENWOOD CORPORATION

Shionogi Shibuya Building, 17-5, 2-chome Shibuya, Shibuya-ku, Tokyo 150, Japan

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AT-250

AUTOMATIC ANTENNA TUNER

CAUTION

1) The AT-250 is capable of sustaining 100W continuous operating input power. However, during auto tuning, very high voltage appears in the tuning circuit and the reflected impedance for the transceiver varies greatly. Therefore, to protect the transceiver, adjust the transmit output to less than 50W before tuning.

2) The antenna tuner is capable of matching a 20–150 ohm load, or approximately up to 2.5:1 SWR. If the antenna and feed system exceed this range, the tuner may not stop, since it is beyond the auto tuner's capability. In this case, do not attempt further auto-tuner operation.
To perform auto-tuner operation, first adjust the antenna and feed system.

You are the owner of our latest product, the new AT-250 Automatic Antenna Tuner. Please read this instruction manual carefully before placing your unit in service. The unit has been carefully engineered and manufactured to rigid quality standards, and should give you satisfactory and dependable operation for many years.

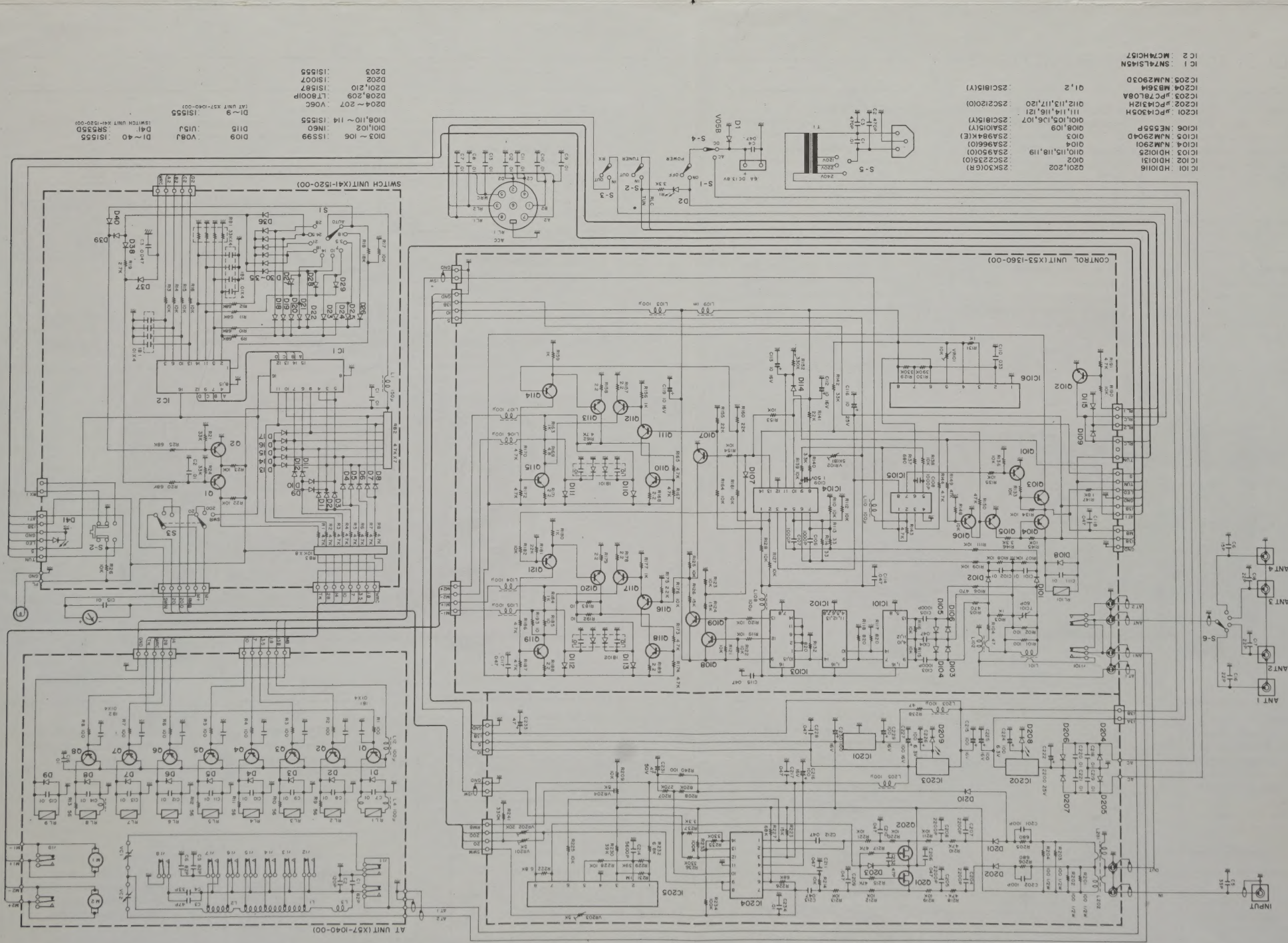
3) The antenna tuner enables to reduce SWR of high SWR antenna.
To transmit power efficiently, use the lower SWR antenna correctly adjusted.

FEATURES

1. **All amateur bands covered in the HF range**
   Covers all amateur bands including the new WARC band from 1.8 through 28 MHz.
2. **Automatic band selection**
   When connected to the TS-430, the operating band is automatically selected from the transceiver.
3. **Dual power source capability**
   Operation from either 120, 220, or 240 V AC or 13.8V DC.
4. **POWER-SWR meter**
   Up to either 20 W or 200 W is indicated by the built-in POWER-SWR meter. When the METER switch is set to SWR, SWR is autoamtically calculated and indicated on the scale.
5. **Four antenna jacks**
   Four antennas cover a broad frequency range. Any of these antennas can be selected by the ANTENNA switch on the front panel.
   In normal operation (with the RX switch OUT), only the transmission signal will pass through the antenna tuner.

SCHEMATIC DIAGRAM

Circuit may be subject to change without notice for improvement.



CONNECTIONS

▪ Connection with the TS-430

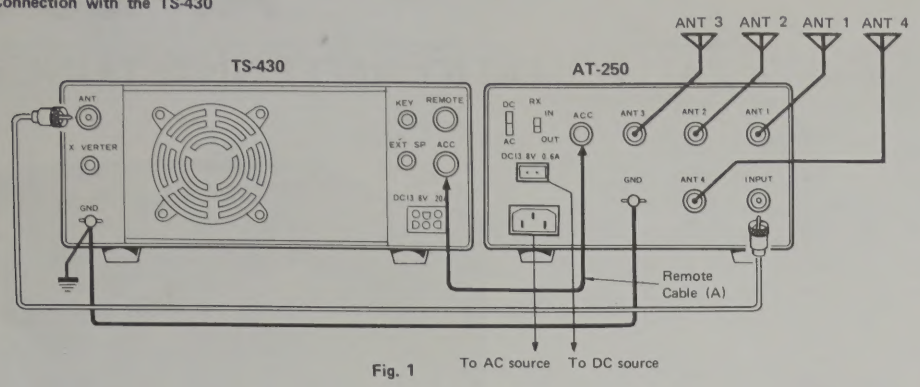


Fig. 1

1. Connect the AT-250 ACC jack to that of the TS-430 with the remote cable (A) supplied.
2. Connect the AT-250 INPUT jack with the coax. cable.
3. Connect antennas to ANT jacks (1–4) in accordance with an operation band.
4. First connect the GND terminal to that of the TS-430 and ground either terminal.
5. Connect power source AC (120 V, 220 V or 240 V selectable) or 13.8 V DC. Then set the DC/AC switch on the rear panel to AC or DC, according to the power source used.

▪ Connection with a transceiver other than the TS-430

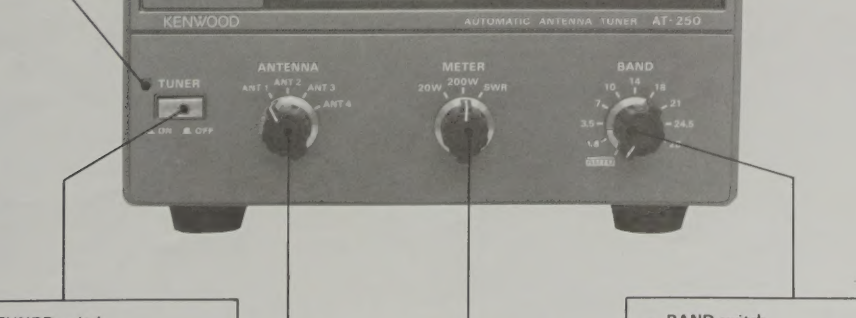


Fig. 2

Connect the AT-250 ACC jack to the transceiver REMOTE jack with the remote cable (B) supplied. (Fig. 3)
Connect the AT-250 ACC pin (3) so that the pin is grounded when transmitting.
Fig. 2 shows connection to a TS-130. The TS-530 and TS-830/TS-120 can also be connected in the same way.
If used with a TS-930, remove the 7-pin wire and insert the 4-pin wire into the 7-pin connector and operate the tuner from the TS-930 control relay.
To operate with a transceiver other than a TS-430, disregard the AUTO setting of the AT-250 BAND switch.
Manually set the switch to the correct band.

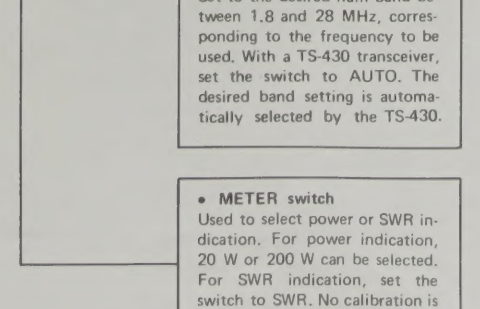


Fig. 3 Remote cable B

Caution: Do not supply the TL-922 output to the AT-250.

▪ Connection with a linear amp.

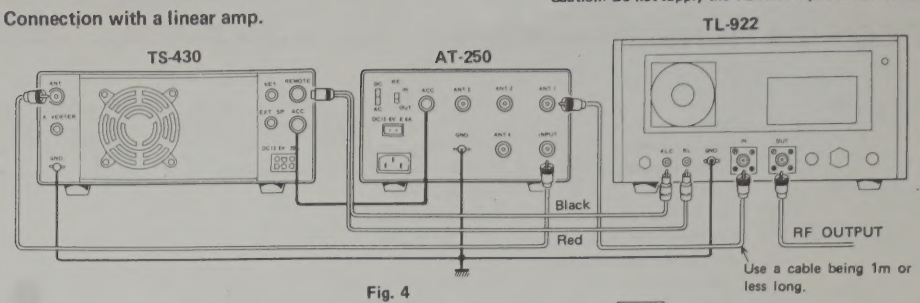
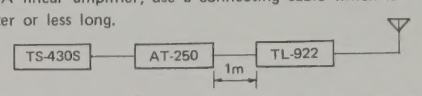


Fig. 4

When connecting the AT-250 to the KENWOOD TL-922/922A linear amplifier, use a connecting cable which is 1 meter or less long.



When operating with a transceiver other than the TS-430, use the REMOTE terminal as shown in Fig. 5. However, a linear amplifier controlled by plus voltage can be used. (Never use a linear amp controlled by minus voltage.)

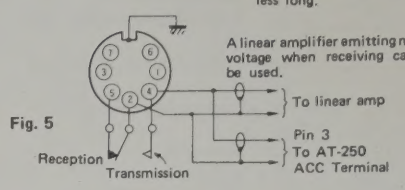


Fig. 5

View from the cord side

OPERATIONS

Initial set-up before operation

Set the POWER switch to OFF.
Set the TUNER switch to OFF.
Set the ANTENNA switch to any one of ANT1–ANT4, corresponding to the antenna connected.
Set the TUNE switch to OFF.
Set the METER switch to either 20 W or 200 W, according to the max. power output of the transceiver used.
Set the BAND switch to the required band. For operation with the TS-430, set it to AUTO.

▪ Antenna SWR measurement

1. Turn the AT-250 POWER switch ON.
2. Operate the transceiver to transmit with reduced CW Power (50 W or less), in the TUNE mode.
3. Place the METER switch to SWR and the antenna SWR will be automatically calculated and displayed on the meter.

Note: To activate the SWR meter, adjust the transmitter to obtain a power output of slightly more than 3 W.

When the SWR is less than 1.5:1, further SWR adjustment is not necessary. However, if it is over 1.5:1 or when further SWR adjustment is required, operate the antenna tuner to obtain a better match, in order to operate the transmitter efficiently.

▪ Auto tuning

1. Place the transceiver in the receive mode, and the TUNER and the TUNE switches to ON.
2. In the configuration, transmitting activates auto tuning and lights the TUNE indicator.
3. When the SWR reaches 1.2:1 or less, the motors stop and the TUNE indicator goes off. In this state, turn the TUNE switch OFF and reset the transceiver to the operating mode desired. The transmitter is ready for normal operation.

The antenna tuner is capable of matching a 20–150 ohm load, or approximately up to a 2.5:1 SWR. If the antenna and feed system exceed this range, the tuner may not stop, since it is beyond the auto tuner's capability. If the tuner does not stop within 20 seconds, discontinue auto-tuner operation and verify the VSWR of your system. If, after changing bands, the auto antenna tuner does not stop at match within 20 seconds, momentarily return to the receive mode, and then again operate the tuner for a match.

Note: The AT-250 is capable of sustaining 100W continuous operating input power. However, during auto tuning, very high voltage appears in the tuning circuit and the reflected impedance for the transceiver varies greatly. Therefore, to protect the transceiver, adjust the transmit output to less than 50W before tuning.

▪ Antenna tuner in receive mode.

In normal operation, the AT-250 allows the transmitting signal to pass through the unit. However, setting the RX IN/OUT switch to IN allows the receiving signal to pass through the unit. With the TUNE switch ON, the receiving signal bypass the unit. With the TUNE switch ON, the receiving signal is allowed to pass through the unit even with the RX IN/OUT switch set to IN. The status of the unit can be monitored by the TUNER indicator.

CONTROLS AND THEIR FUNCTIONS

• POWER switch
Turns the AT-250 power ON-OFF. Before turning the switch ON or OFF, check that the TUNER switch and the TUNE switch are set to OFF.

• POWER-SWR meter
Indicates transmit power and SWR. The power scale has two readings, up to 20 W and up to 200 W, selected by the METER switch.

• TUNE switch
Used to activate the auto tuning function. With the TUNER switch ON, setting this switch to ON provides an SWR of less than 1.2:1. After auto-tuning is complete and the TUNE indicator goes off, set the switch to OFF and operate the transceiver. When operating the transceiver with this switch at ON, the motor may activate during operation. With the switch to ON, the receive signal does not pass through the antenna tuner even with the RX IN-OUT switch on the rear panel set to IN.

• TUNER indicator
Light ON: The signal passes through the antenna tuner.
Light OFF: The antenna tuner is through.

• TUNE indicator
Lights when auto tuning is in operation. Goes off when auto tuning is complete and the motor stops.

• TUNER switch
ON: Transmit signal passes through the antenna tuner. Receive signal depends on the RX IN-OUT switch setting (rear panel) and the TUNER switch setting.
OFF: The antenna tuner is "through" in all modes.

• ANTENNA switch
Since 4 antennas can be connected to the unit, select the desired antenna when changing frequency or bands.

• BAND switch
Set to the desired ham band between 1.8 and 28 MHz, corresponding to the frequency to be used. With a TS-430 transceiver, set the switch to AUTO. The desired band setting is automatically selected by the TS-430.

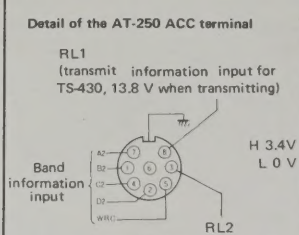
• METER switch
Used to select power or SWR indication. For power indication, 20 W or 200 W can be selected. For SWR indication, set the switch to SWR. No calibration is required, since this is an automatic instrument.

• DC/AC switch
Used to select DC or AC power source. Be sure to set the switch to DC or AC, depending on the power source selected.

• RX IN-OUT switch
Before shipment, this switch is set to OUT, With this setting, only a transmit signal passes through the antenna tuner. With the switch set to IN, both transmit and receive signals pass through the antenna tuner.

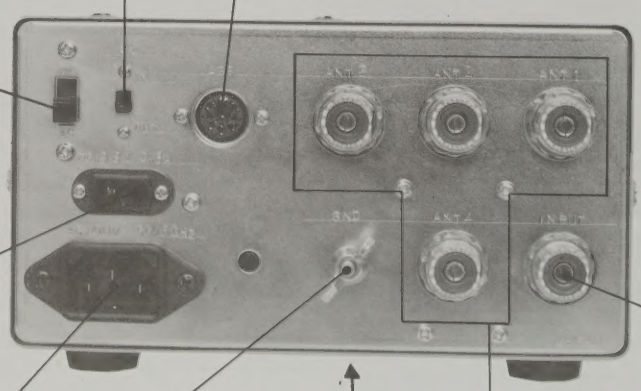
• ACC jack
An input jack for controlling the AT-250. Using the control cable supplied, connect the transceiver to this jack.

Detail of the AT-250 ACC terminal


RL1
(transmit information input for TS-430, 13.8 V when transmitting)
Band information input
H 3.4V
L 0 V
RL2
(transmit information input for transceiver other than TS-430, grounded when transmitting)
View from unit inside

The following are band informations fed to the ACC jack.

Band	D2	C2	B2	A2	WRC
1.8	L(0)	L(0)	H(1)	L(0)	L(0)
3.5	L(0)	L(0)	H(1)	H(1)	L(0)
7	L(0)	H(1)	L(0)	H(1)	L(0)
10	L(0)	H(1)	H(1)	L(0)	H(1)
14	L(0)	H(1)	H(1)	H(1)	L(0)
18	H(1)	L(0)	L(0)	L(0)	H(1)
21	H(1)	L(0)	L(0)	L(0)	L(0)
24.5	H(1)	L(0)	L(0)	H(1)	H(1)
28	H(1)	L(0)	L(0)	H(1)	L(0)



• AC power connector
When AC power (120, 220 or 240 V selectable) is to be used, connect the supplied AC cable here.

• POWER VOLTAGE SELECTOR switch
With this switch, on the bottom panel, select your local line voltage.

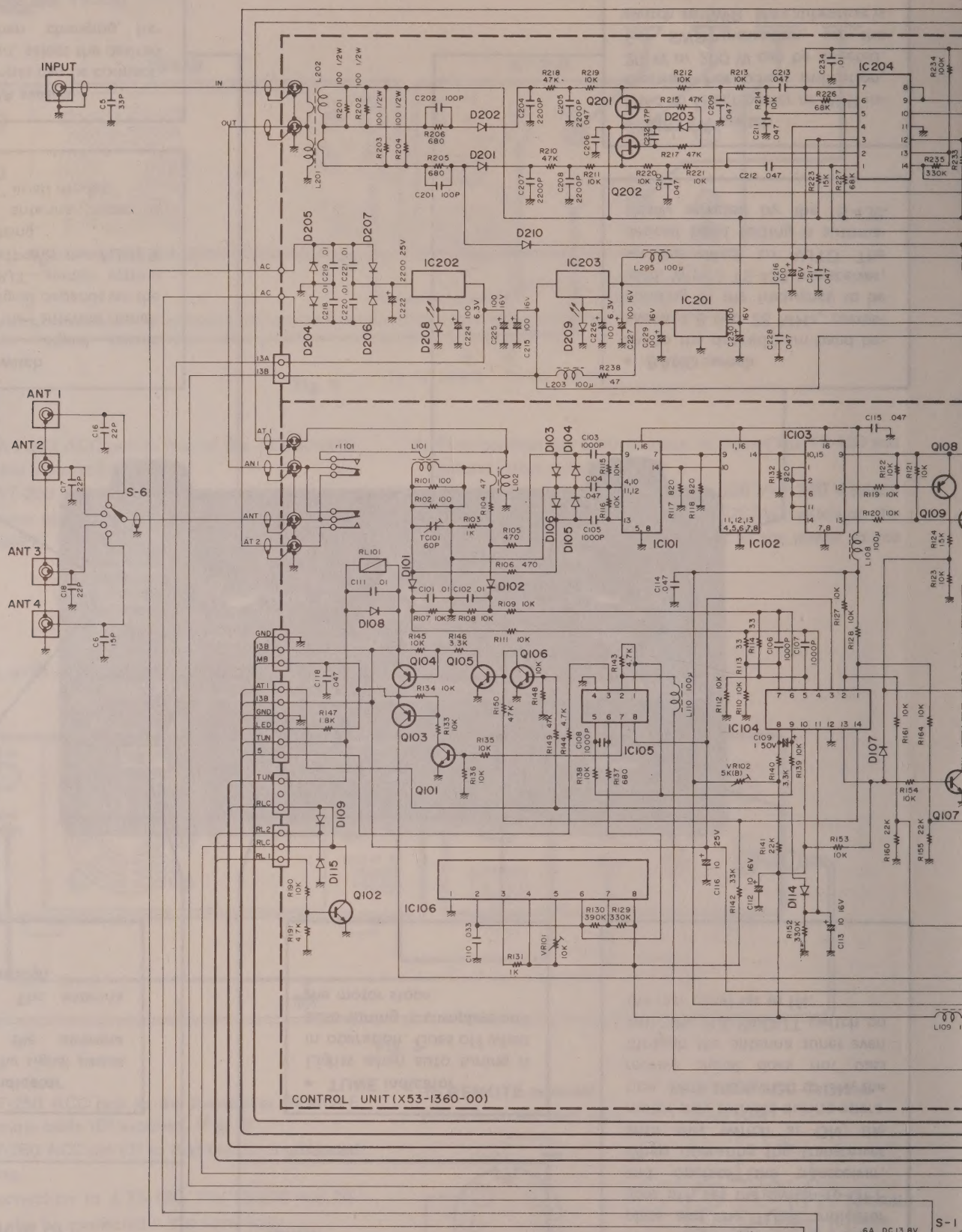
• INPUT jack
Input jack for the antenna tuner. Connect the transceiver antenna jack to this INPUT jack.

• DC power connector
When DC power (13.8 V) is to be used, connect here.

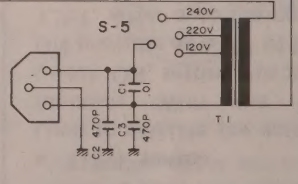
• GND terminal
GND terminal for the AT-250. Connect the transceiver GND terminal to this terminal. Grounding the terminal prevents TVI and BCI.

• ANT 1 – ANT 4 jacks
Coaxial antenna jacks. Connect antennas corresponding to your operating frequency range.

SCHEMATIC DIAGRAM



IC 101	: HD10116	Q201, 202	: 2SK30(GR)
IC 102	: HD10131	Q102	: 2SC2235(O)
IC 103	: HD10125	Q110, 115, 118, 119	: 2SA950(O)
IC 104	: NJM2901	Q104	: 2SA966(O)
IC 105	: NJM2904D	Q103	: 2SA984K(E)
IC 106	: NE555P	Q108, 109	: 2SA1015(Y)
		Q101, 105, 106, 107	: 2SC1815(Y)
IC 201	: μPC14305H	111, 114, 116, 121	
IC 202	: μPC14312H	Q112, 113, 117, 120	: 2SC2120(O)
IC 203	: μPC78L08A		
IC 204	: MB3614	Q1, 2	: 2SC1815(Y)
IC 205	: NJM2903D		
IC 1	: SN74LS145N		
IC 2	: MC74HC157		

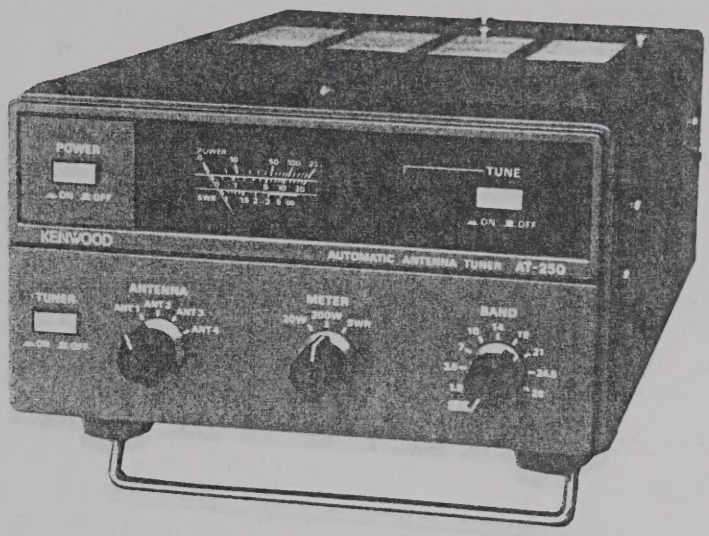


Orig

(ACTUALLY -
There is
The "Orig"
underneath)

AT-250

AUTOMATIC ANTENNA TUNER



CAUTION

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2) The antenna tuner is capable of matching a 20—150 ohm load, or approximately up to 2.5:1 SWR. If the antenna and feed system exceed this range, the tuner may not stop, since it is beyond the auto tuner's capability. In this case, do not attempt further auto-tuner operation.
To perform auto-tuner operation, first adjust the antenna and feed system.

You are the owner of our latest product, the new AT-250 Automatic Antenna Tuner. Please read this instruction manual carefully before placing your unit in service. The unit has been carefully engineered and manufactured to rigid quality standards, and should give you satisfactory and dependable operation for many years.

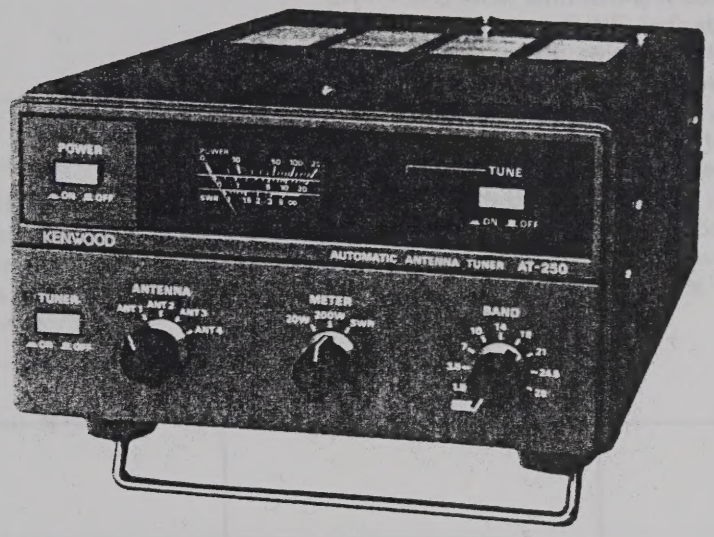
3) The antenna tuner enables to reduce SWR of high SWR antenna.
To transmit power efficiently, use the lower SWR antenna correctly adjusted.

FEATURES

1. **All amateur bands covered in the HF range**
Covers all amateur bands including the new WARC band from 1.8 through 28 MHz.
2. **Automatic band selection**
When connected to the TS-430, the operating band is automatically selected from the transceiver.
3. **Dual power source capability**
Operation from either 120, 220, or 240 V AC or 13.8V DC.
4. **POWER-SWR meter**
Up to either 20 W or 200 W is indicated by the built-in POWER-SWR meter. When the METER switch is set to SWR, SWR is autoamtically calculated and indicated on the scale.
5. **Four antenna jacks**
Four antennas cover a broad frequency range. Any of these antennas can be selected by the ANTENNA switch on the front panel.
In normal operation (with the RX switch OUT), only the transmission signal will pass through the antenna tuner.

AT-250

AUTOMATIC ANTENNA TUNER



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AT-250

AUTOMATIC ANTENNA TUNER

CONTROLS AND THEIR FUNCTIONS

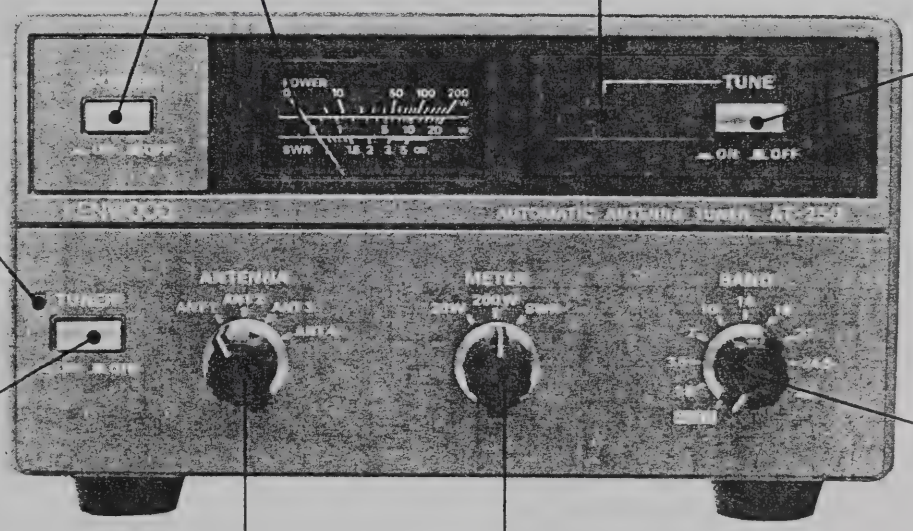
- **POWER switch**
Turns the AT-250 power ON-OFF. Before turning the switch ON or OFF, check that the TUNER switch and the TUNE switch are set to OFF.

- **POWER-SWR meter**
Indicates transmit power and SWR. The power scale has two readings, up to 20 W and up to 200 W, selected by the METER switch.

- **TUNE switch**
Used to activate the auto tuning function. With the TUNER switch ON, setting this switch to ON provides an SWR of less than 1.2:1. After auto-tuning is complete and the TUNE indicator goes off, set the switch to OFF and operate the transceiver. When operating the transceiver with this switch at ON, the motor may activate during operation. With the switch to ON, the receive signal does not pass through the antenna tuner even with the RX IN-OUT switch on the rear panel set to IN.

- **TUNER indicator**
Light ON: The signal passes through the antenna tuner.
Light OFF: The antenna tuner is through.

- **TUNE indicator**
Lights when auto tuning is in operation. Goes off when auto tuning is complete and the motor stops.



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ON: Transmit signal passes through the antenna tuner. Receive signal depends on the RX IN-OUT switch setting (rear panel) and the TUNER switch setting.
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- **BAND switch**
Set to the desired ham band between 1.8 and 28 MHz, corresponding to the frequency to be used. With a TS-430 transceiver, set the switch to AUTO. The desired band setting is automatically selected by the TS-430.

- **ANTENNA switch**
Since 4 antennas can be connected to the unit, select the desired antenna when changing frequency or bands.

- **METER switch**
Used to select power or SWR indication. For power indication, 20 W or 200 W can be selected. For SWR indication, set the switch to SWR. No calibration is required, since this is an automatic instrument.

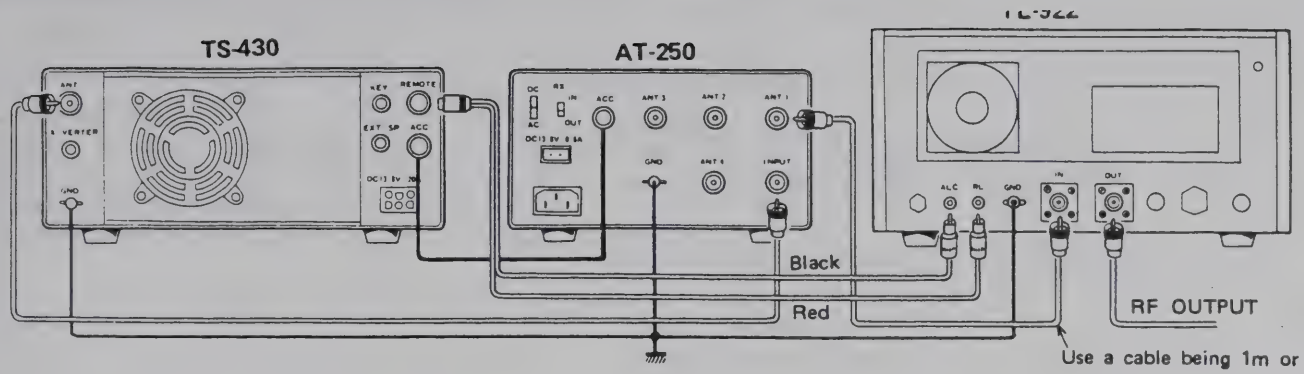

Fig. 4

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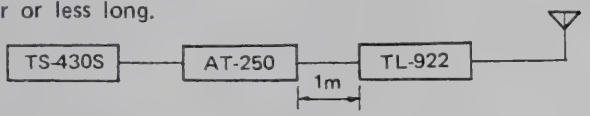

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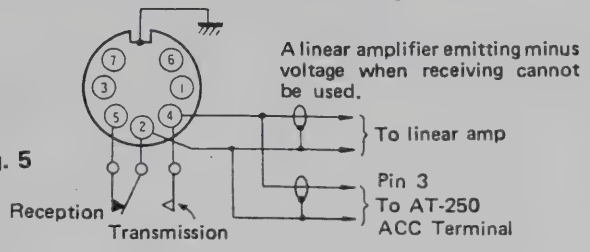
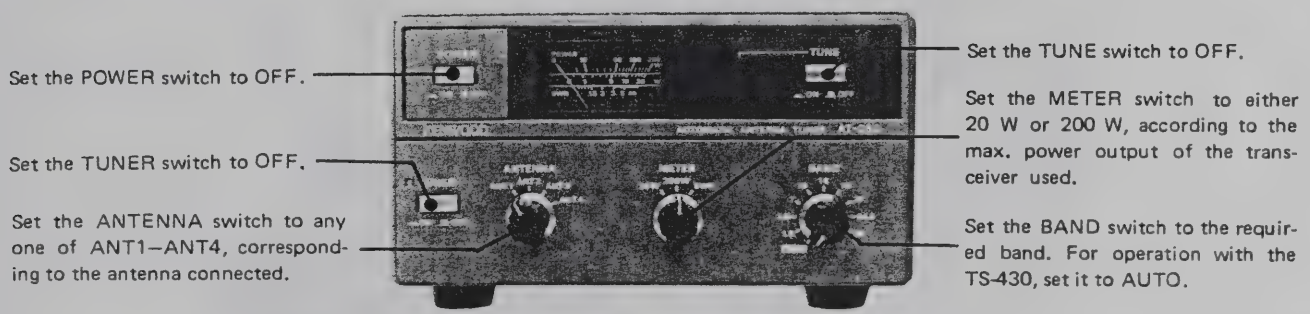


Fig. 5

View from the cord side

OPERATIONS

Initial set-up before operation


Set the POWER switch to OFF.
Set the TUNER switch to OFF.
Set the ANTENNA switch to any one of ANT1—ANT4, corresponding to the antenna connected.
Set the TUNE switch to OFF.
Set the METER switch to either 20 W or 200 W, according to the max. power output of the transceiver used.
Set the BAND switch to the required band. For operation with the TS-430, set it to AUTO.

▪ Antenna SWR measurement

1. Turn the AT-250 POWER switch ON.
2. Operate the transceiver to transmit with reduced CW Power (50 W or less), in the TUNE mode.
3. Place the METER switch to SWR and the antenna SWR will be automatically calculated and displayed on the meter.

Note: To activate the SWR meter, adjust the transmitter to obtain a power output of slightly more than 3 W.

When the SWR is less than 1.5:1, further SWR adjustment is not necessary. However, if it is over 1.5:1 or when further SWR adjustment is required, operate the antenna tuner to obtain a better match, in order to operate the transmitter efficiently.

▪ Auto tuning

1. Place the transceiver in the receive mode, and the TUNER and the TUNE switches to ON.
2. In the configuration, transmitting activates auto tuning and lights the TUNE indicator.
3. When the SWR reaches 1.2:1 or less, the motors stop and the TUNE indicator goes off. In this state, turn the TUNE switch OFF and reset the transceiver to the operating mode desired. The transmitter is ready for normal operation.

The antenna tuner is capable of matching a 20—150 ohm load, or approximately up to a 2.5:1 SWR. If the antenna and feed system exceed this range, the tuner may not stop, since it is beyond the auto tuner's capability. If the tuner does not stop within 20 seconds, discontinue auto-tuner operation and verify the VSWR of your system. If, after changing bands, the auto antenna tuner does not stop at match within 20 seconds, momentarily return to the receive mode, and then again operate the tuner for a match.

Note: The AT-250 is capable of sustaining 100W continuous operating input power. However, during auto tuning, very high voltage appears in the tuning circuit and the reflected impedance for the transceiver varies greatly. Therefore, to protect the transceiver, adjust the transmit output to less than 50W before tuning.

▪ Antenna tuner in receive mode.

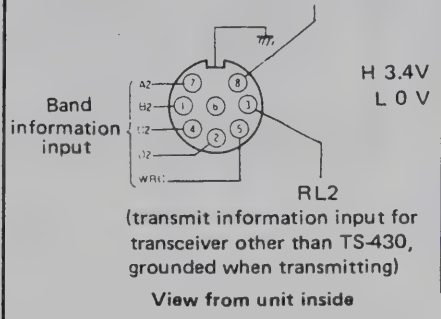
In normal operation, the AT-250 allows the transmitting signal to pass through the unit. However, setting the RX IN/OUT switch to IN allows the receiving signal to pass through the unit. With the TUNE switch ON, the receiving signal bypass the unit. With the TUNE switch ON, the receiving signal is allowed to pass through the unit even with the RX IN/OUT switch set to IN. The status of the unit can be monitored by the TUNER indicator.

• **DC/AC switch**
Used to select DC or AC power source. Be sure to set the switch to DC or AC, depending on the power source selected.

• **RX IN-OUT switch**
Before shipment, this switch is set to OUT, With this setting, only a transmit signal passes through the antenna tuner. With the switch set to IN, both transmit and receive signals pass through the antenna tuner.

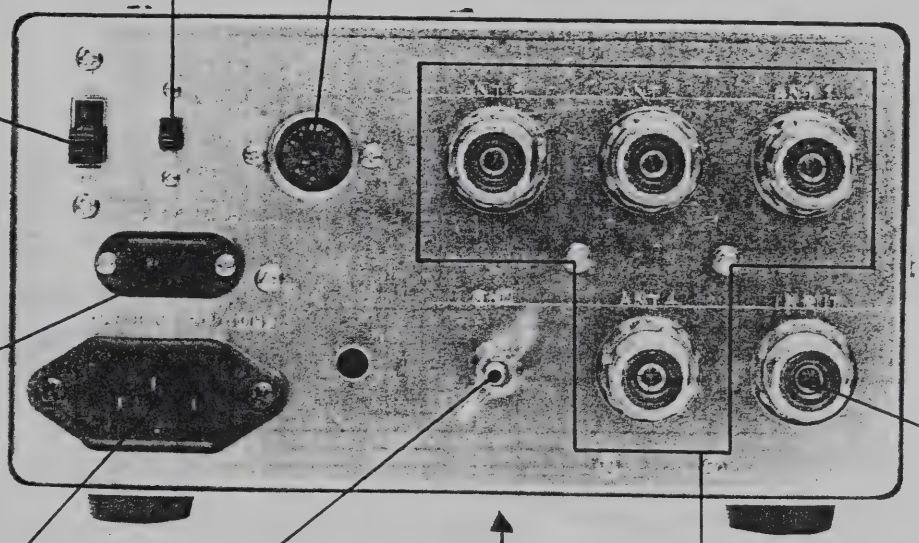
• **ACC jack**
An input jack for controlling the AT-250. Using the control cable supplied, connect the transceiver to this jack.

Detail of the AT-250 ACC terminal


RL1
(transmit information input for TS-430, 13.8 V when transmitting)
H 3.4V
L 0 V
Band information input
RL2
(transmit information input for transceiver other than TS-430, grounded when transmitting)
View from unit inside

The following are band informations fed to the ACC jack.

Band	D2	C2	B2	A2	WRC
1.8	L(0)	L(0)	H(1)	L(0)	L(0)
3.5	L(0)	L(0)	H(1)	H(1)	L(0)
7	L(0)	H(1)	L(0)	H(1)	L(0)
10	L(0)	H(1)	H(1)	L(0)	H(1)
14	L(0)	H(1)	H(1)	H(1)	L(0)
18	H(1)	L(0)	L(0)	L(0)	H(1)
21	H(1)	L(0)	L(0)	L(0)	L(0)
24.5	H(1)	L(0)	L(0)	H(1)	H(1)
28	H(1)	L(0)	L(0)	H(1)	L(0)



• **AC power connector**
When AC power (120, 220 or 240 V selectable) is to be used, connect the supplied AC cable here.

• **POWER VOLTAGE SELECTOR switch**
With this switch, on the bottom panel, select your local line voltage.

• **INPUT jack**
Input jack for the antenna tuner. Connect the transceiver antenna jack to this INPUT jack.

• **DC power connector**
When DC power (13.8 V) is to be used, connect here.

• **GND terminal**
GND terminal for the AT-250. Connect the transceiver GND terminal to this terminal. Grounding the terminal prevents TVI and BCI.

• **ANT 1 – ANT 4 jacks**
Coaxial antenna jacks. Connect antennas corresponding to your operating frequency range.

▪ Connection with the TS-430

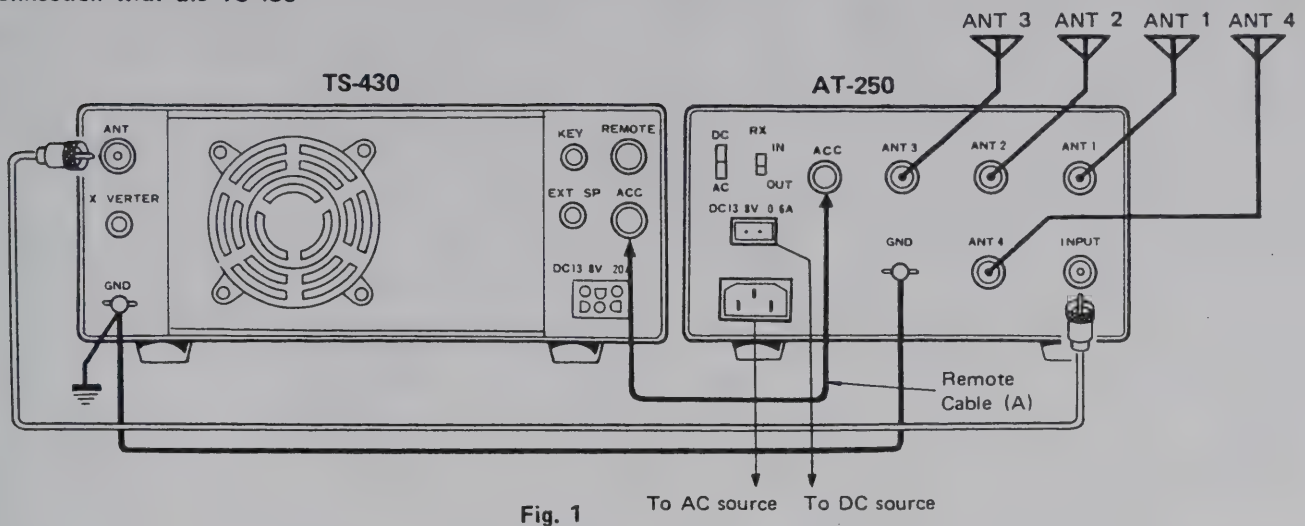


Fig. 1

1. Connect the AT-250 ACC jack to that of the TS-430 with the remote cable (A) supplied.
2. Connect the AT-250 INPUT jack with the coax. cable.
3. Connect antennas to ANT jacks (1–4) in accordance with an operation band.
4. First connect the GND terminal to that of the TS-430 and ground either terminal.
5. Connect power source AC (120 V, 220 V or 240 V selectable) or 13.8 V DC. Then set the DC/AC switch on the rear panel to AC or DC, according to the power source used.

▪ Connection with a transceiver other than the TS-430

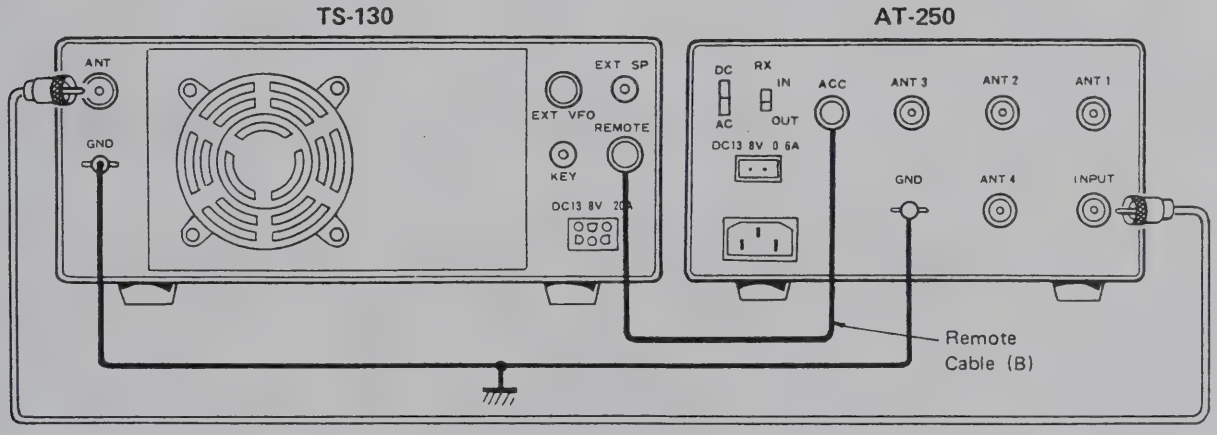


Fig. 2

Connect the AT-250 ACC jack to the transceiver REMOTE jack with the remote cable (B) supplied. (Fig. 3)
Connect the AT-250 ACC pin (3) so that the pin is grounded when transmitting.
Fig. 2 shows connection to a TS-130. The TS-530 and TS-830/TS-120 can also be connected in the same way.
If used with a TS-930, remove the 7-pin wire and insert the 4-pin wire into the 7-pin connector and operate the tuner from the TS-930 control relay.
To operate with a transceiver other than a TS-430, disregard the AUTO setting of the AT-250 BAND switch.
Manually set the switch to the correct band.

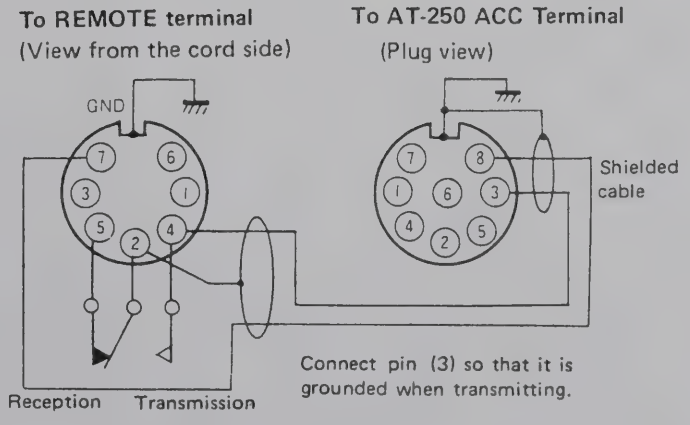


Fig. 3 Remote cable B

1.	**Frequency range**	All amateur bands from 1.8 – 29.7 MHz
2.	**Input impedance**	50 ohms unbalanced
3.	**Output impedance**	20 – 150 ohms unbalanced
4.	**Insertion loss**	0.8 dB or less
5.	**Pass through power**	100W (200W PEP)
6.	**SWR value for motor stop**	1.2:1 or less
7.	**Min. power for activation**	3W
8.	**Max. tuning time**	Within 15 seconds
9.	**Power meter (peak value reading)**	± 10% at 100W (Meter Switch 200W Position) ± 10% at 10W (Meter Switch 20W Position)
10.	**Power consumption (current)**	15W AC 13.8V DC 600 mA
11.	**Power requirement**	120V, 220V, or 240V AC selectable 13.8V (12–16) DC
12.	**Dimensions**	W174 (174) x H96 (107) x D257 (289) mm ( ) shows projections included.
	Weight	4.2 kg (9.24 lb.)
13.	**Package dimensions**	W385 x H167 x D264 mm Capacitance: 0.017 m^3
14.	**Semiconductors**	ICs 13 FETs 2 Transistors 31 Diodes 77

ACCESSORIES

Remote cable (A) 1
Remote cable (B) 1
AC power cable 1
Grounding wire 1
Instruction manual 1

Specifications may be subject to change without notice for technical improvement.

TRIO-KENWOOD CORPORATION

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Rembrücker Str. 15, 6056 Heusenstamm, West Germany

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TRIO-KENWOOD (AUSTRALIA) PTY. LTD. (INCORPORATED IN N.S.W.)
4E. Woodcock Place, Lane Cove, N.S.W. 2066, Australia

(1) (2) (3) (4) (5) (6) (7) (8) (9)

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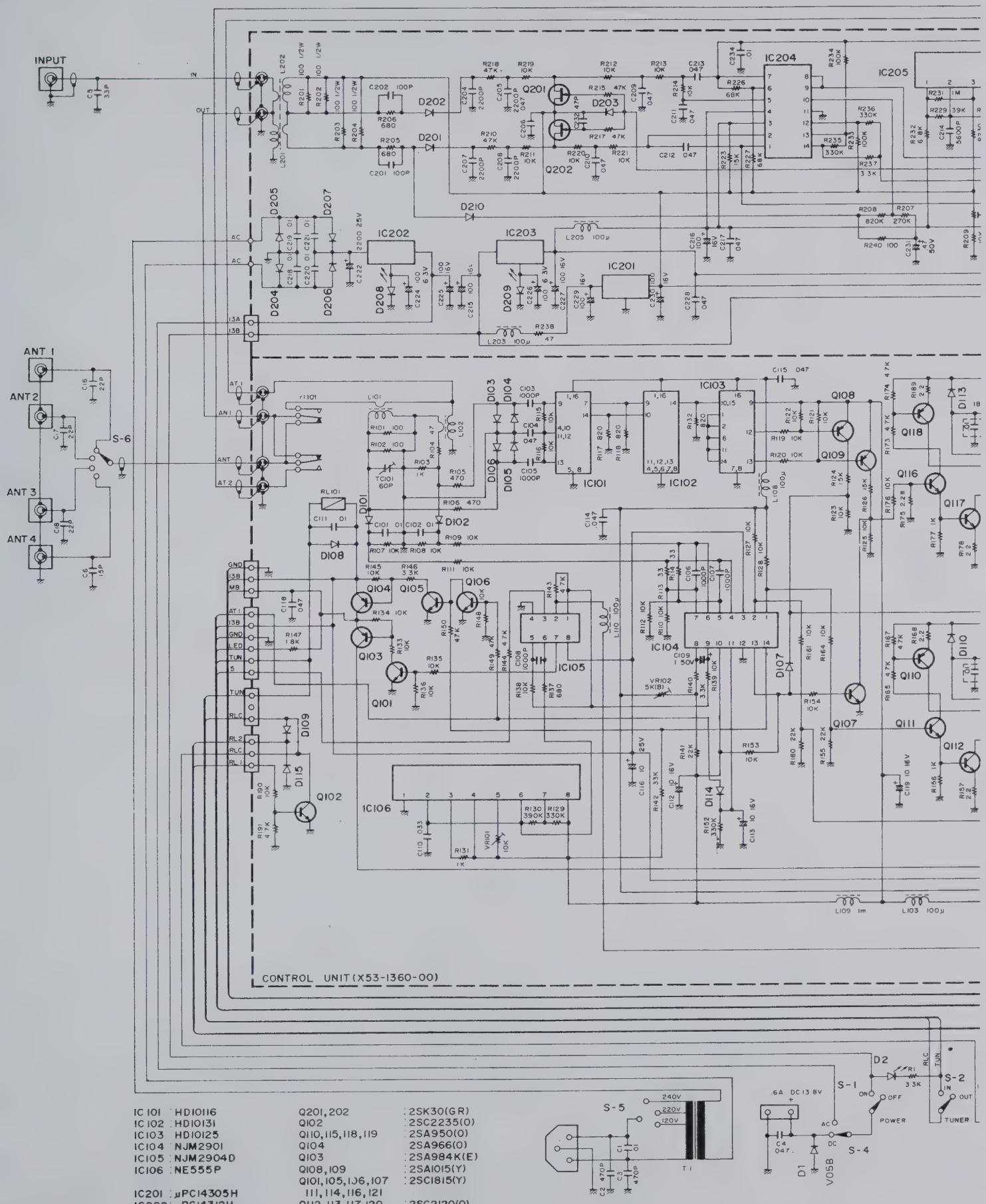
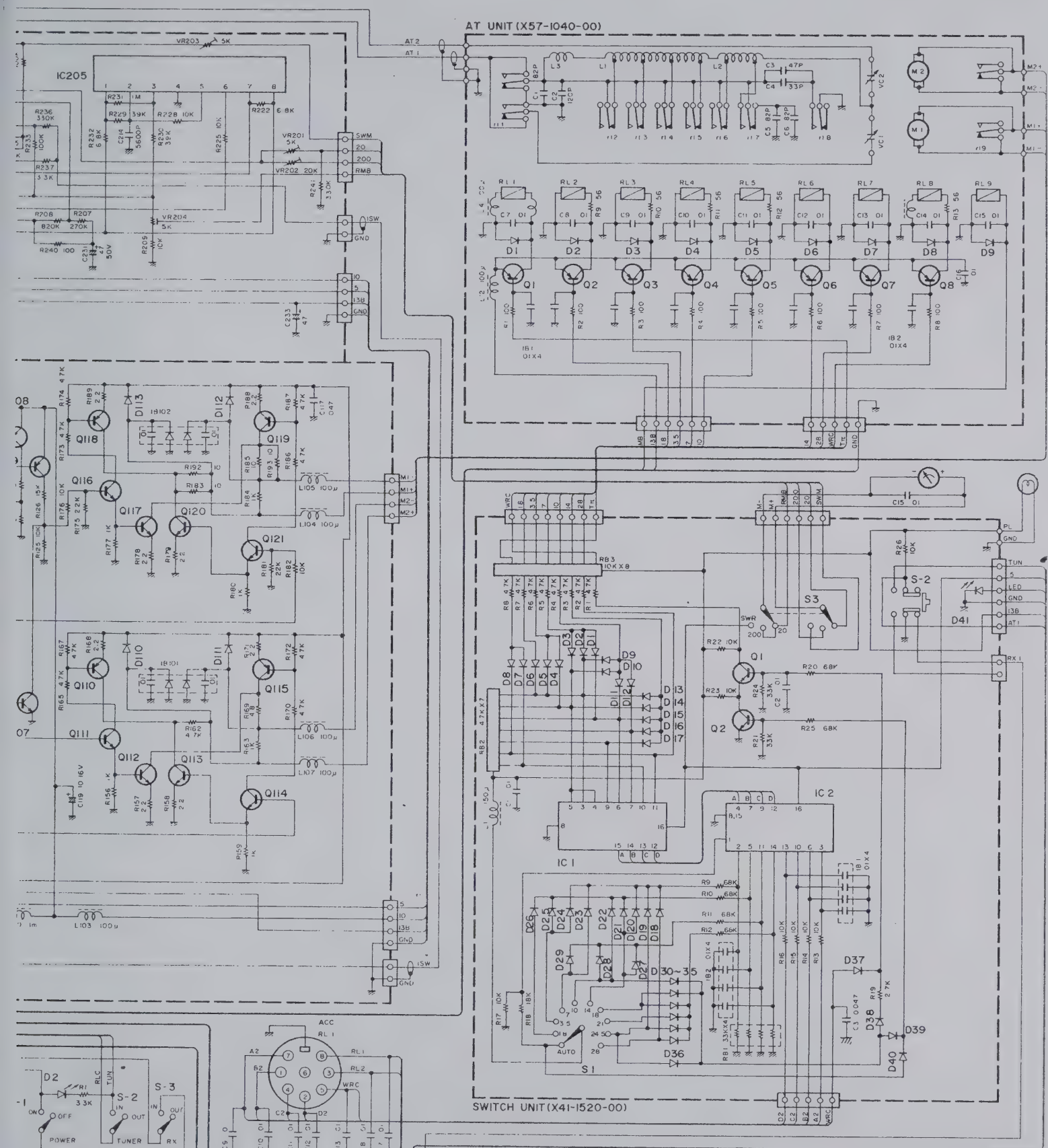
HEMATIC DIAGRAM



IC101 : HD10116	Q201,202	: 2SK30(GR)
IC102 : HD10131	Q102	: 2SC2235(O)
IC103 : HD10125	Q110,115,118,119	: 2SA950(O)
IC104 : NJM2901	Q104	: 2SA966(O)
IC105 : NJM2904D	Q103	: 2SA984K(E)
IC106 : NE555P	Q108,109	: 2SA1015(Y)
	Q101,105,106,107	: 2SC1815(Y)
IC201 : μPC14305H	111,114,116,121	
IC202 : μPC14312H	Q112,113,117,120	: 2SC2120(O)
IC203 : μPC78L08A		
IC204 : MB3614	Q1,2	: 2SC1815(Y)
IC205 : NJM2903D		

Circuit may be subject to change without notice for improvement.



D103 ~ 106	:1SS99	D109	:V08J	D1 ~ 40	:1SI555
D101, 102	:1N60	D115	:U15J	D41	:SR535D
D108, 110 ~ 114	:1SI555			(SWITCH UNIT X41-1520-00)	
		D1 ~ 9	:1SI555		
D204 ~ 207	:V06C	(AT UNIT X57-1040-00)			
D208, 209	:LT8001P				
D201, 210	:1SI587				
D202	:1SI007				

SUPER DEFIANT MODEL SX25

OPERATING INSTRUCTIONS

The engineers of the Hallicrafters Co. have embodied in the Super Defiant Model SX25 receiver every worthwhile advancement that has been made in the communications field. The user of the SX25 should find in this receiver the complete answer to his reception requirements.

It is recommended that, upon receipt, the owner of the SX25 receiver carefully inspect the carton and then the receiver for any damage which might have occurred in transit. Should any signs of damage be apparent immediately file claim with the carrier accurately stating the extent of the damage.

ANTENNA

The SUPER Defiant has an antenna input circuit which will allow the use of either a doublet or Marconi (inverted "L") antenna. The approximate antenna input impedance of the SX25 is 400 ohms.

A very serviceable antenna will be the inverted "L", or Marconi type. This antenna should be approximately 75 feet long overall, including the lead-in to the set. Satisfactory operation of the SUPER Defiant is obtained throughout its tuning range with this type of antenna and because of that fact as well as its ease of construction it is highly recommended.

With the inverted "L" type of antenna A_2 must remain connected to G for best operation. While a ground connection is usually not necessary it might prove to be helpful in reducing noise. A cold water pipe or 6' foot rod driven in moist soil will be a very satisfactory ground when connected to the G terminal on the receiver. Connections to a radiator or gas piping are not recommended.

Should a doublet antenna be used it is suggested that a transmission line of 400 ohms value of impedance be constructed so that a most efficient transfer of energy is obtained. The commercially available all wave doublet antennas are usually provided with a coupling transformer which matches the transmission line to the receiver. This transformer connects to the A_1 and A_2 terminals on the antenna strip. The half-wave length-doublet antenna cut for a particular frequency can be computed by the following formula:

$$\text{Length in feet} = \frac{463}{\text{Frequency in megacycles}}$$

or for example, a half wave 20 meter or 14 megacycle antenna would be

$$\frac{463}{14} \text{ or } 33.7 \text{ feet long overall}$$

This type of antenna is broken in the center with an insulator and has the transmission line connected to each resulting quarter wave section at that point. This antenna is a very good performer, in a direction broadside to its length, only on the relatively narrow group of frequencies for which it was cut. It does not function well on harmonic frequencies.

When using either type of doublet antennas the transmission line should be connected to A_1 and A_2 binding posts. The wire connecting the A_2 to ground or G can be left connected if the performance of the receiver is improved.

FREQUENCY RANGE

The SUPER Defiant tunes from 540 kilocycles to 42 megacycles in four bands. The frequencies covered per band are as follows:

Band	Coverage
1	540 KC to 1,700 KC
2	1.7 MC to 5.1 MC
3	5.0 MC to 15.7 MC
4	15.2 MC to 42 MC

The main tuning dial, which appears behind the large escutcheon, is accurately calibrated in kilocycles on band #1 and in megacycles on the remaining four bands.

Note: The accuracy of the main dial calibration will hold only if the BAND SPREAD condenser is set at minimum capacity, or the position indicated by 100 on the Band Spread dial which has been approached by turning the Band Spread Knob in a clockwise direction, or to the right, as far as it will go.

You first using the receiver, become familiar with its operation on the standard broadcast band, or Band #1 before tuning the short wave bands. You then will be able to fully appreciate the capabilities of your Defiant.

AT-250

AUTOMATIC ANTENNA TUNER

CAUTION

1) The AT-250 is capable of sustaining 100W continuous operating input power. However, during auto tuning, very high voltage appears in the tuning circuit and the reflected impedance for the transceiver varies greatly. Therefore, to protect the transceiver, adjust the transmit output to less than 50W before tuning.
2) The antenna tuner is capable of matching a 20—150 ohm load, or approximately up to 2.5:1 SWR. If the antenna and feed system exceed this range, the tuner may not stop, since it is beyond the auto tuner's capability. In this case, do not attempt further auto-tuner operation.
   To perform auto-tuner operation, first adjust the antenna and feed system.

You are the owner of our latest product, the new AT-250 Automatic Antenna Tuner. Please read this instruction manual carefully before placing your unit in service. The unit has been carefully engineered and manufactured to rigid quality standards, and should give you satisfactory and dependable operation for many years.

3) The antenna tuner enables to reduce SWR of high SWR antenna.
   To transmit power efficiently, use the lower SWR antenna correctly adjusted.

FEATURES

1. **All amateur bands covered in the HF range**
   Covers all amateur bands including the new WARC band from 1.8 through 28 MHz.
2. **Automatic band selection**
   When connected to the TS-430, the operating band is automatically selected from the transceiver.
3. **Dual power source capability**
   Operation from either 120, 220, or 240 V AC or 13.8V DC.
4. **POWER-SWR meter**
   Up to either 20 W or 200 W is indicated by the built-in POWER-SWR meter. When the METER switch is set to SWR, SWR is autoamtically calculated and indicated on the scale.
5. **Four antenna jacks**
   Four antennas cover a broad frequency range. Any of these antennas can be selected by the ANTENNA switch on the front panel.
   In normal operation (with the RX switch OUT), only the transmission signal will pass through the antenna tuner.

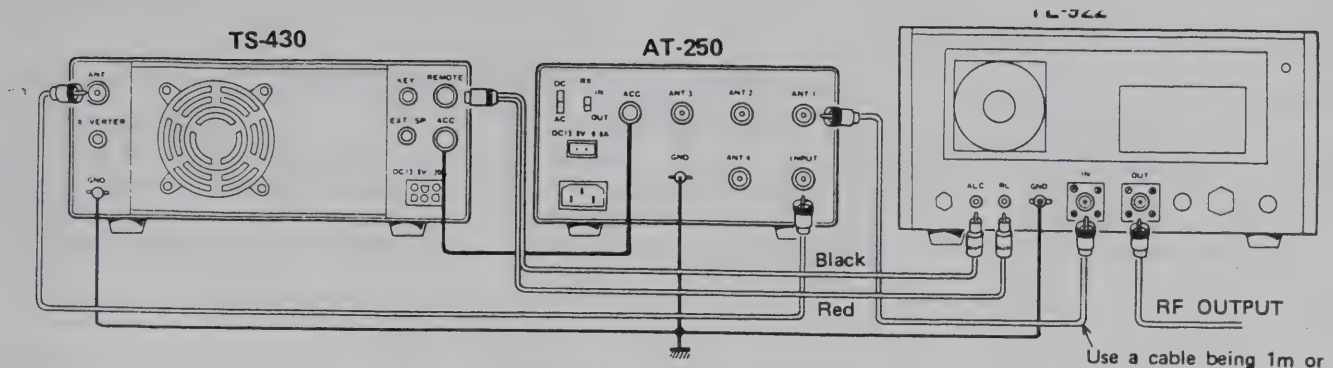
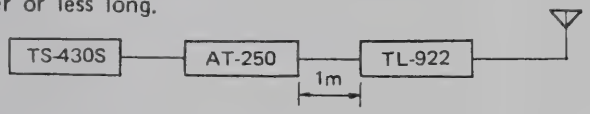


Fig. 4

When connecting the AT-250 to the KENWOOD TL-922/922A linear amplifier, use a connecting cable which is 1 meter or less long.



When operating with a transceiver other than the TS-430, use the REMOTE terminal as shown in Fig. 5. However, a linear amplifier controlled by plus voltage can be used. (Never use a linear amp controlled by minus voltage.)

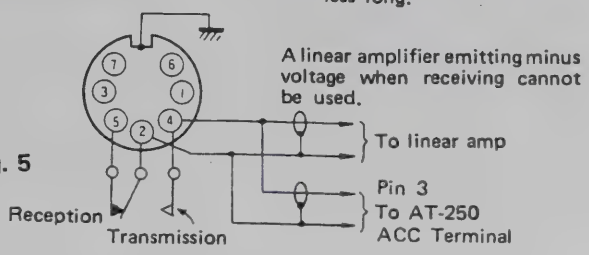
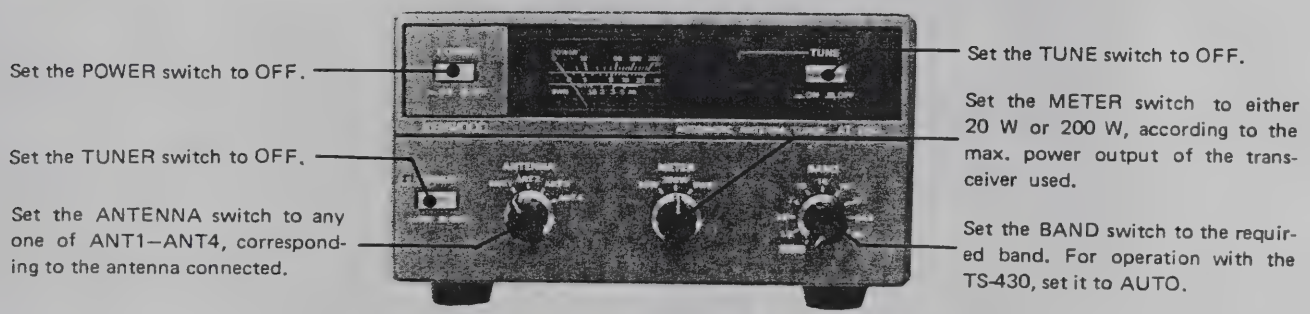


Fig. 5

View from the cord side

OPERATIONS

Initial set-up before operation


Set the POWER switch to OFF.
Set the TUNER switch to OFF.
Set the ANTENNA switch to any one of ANT1—ANT4, corresponding to the antenna connected.
Set the TUNE switch to OFF.
Set the METER switch to either 20 W or 200 W, according to the max. power output of the transceiver used.
Set the BAND switch to the required band. For operation with the TS-430, set it to AUTO.

▪ Antenna SWR measurement

1. Turn the AT-250 POWER switch ON.
2. Operate the transceiver to transmit with reduced CW Power (50 W or less), in the TUNE mode.
3. Place the METER switch to SWR and the antenna SWR will be automatically calculated and displayed on the meter.

Note: To activate the SWR meter, adjust the transmitter to obtain a power output of slightly more than 3 W.

When the SWR is less than 1.5:1, further SWR adjustment is not necessary. However, if it is over 1.5:1 or when further SWR adjustment is required, operate the antenna tuner to obtain a better match, in order to operate the transmitter efficiently.

▪ Auto tuning

1. Place the transceiver in the receive mode, and the TUNER and the TUNE switches to ON.
2. In the configuration, transmitting activates auto tuning and lights the TUNE indicator.
3. When the SWR reaches 1.2:1 or less, the motors stop and the TUNE indicator goes off. In this state, turn the TUNE switch OFF and reset the transceiver to the operating mode desired. The transmitter is ready for normal operation.

The antenna tuner is capable of matching a 20—150 ohm load, or approximately up to a 2.5:1 SWR. If the antenna and feed system exceed this range, the tuner may not stop, since it is beyond the auto tuner's capability. If the tuner does not stop within 20 seconds, discontinue auto-tuner operation and verify the VSWR of your system. If, after changing bands, the auto antenna tuner does not stop at match within 20 seconds, momentarily return to the receive mode, and then again operate the tuner for a match.

Note: The AT-250 is capable of sustaining 100W continuous operating input power. However, during auto tuning, very high voltage appears in the tuning circuit and the reflected impedance for the transceiver varies greatly. Therefore, to protect the transceiver, adjust the transmit output to less than 50W before tuning.

▪ Antenna tuner in receive mode.

In normal operation, the AT-250 allows the transmitting signal to pass through the unit. However, setting the RX IN/OUT switch to IN allows the receiving signal to pass through the unit. With the TUNE switch ON, the receiving signal bypass the unit. With the TUNE switch ON, the receiving signal is allowed to pass through the unit even with the RX IN/OUT switch set to IN. The status of the unit can be monitored by the TUNER indicator.

CONTROLS AND THEIR FUNCTIONS

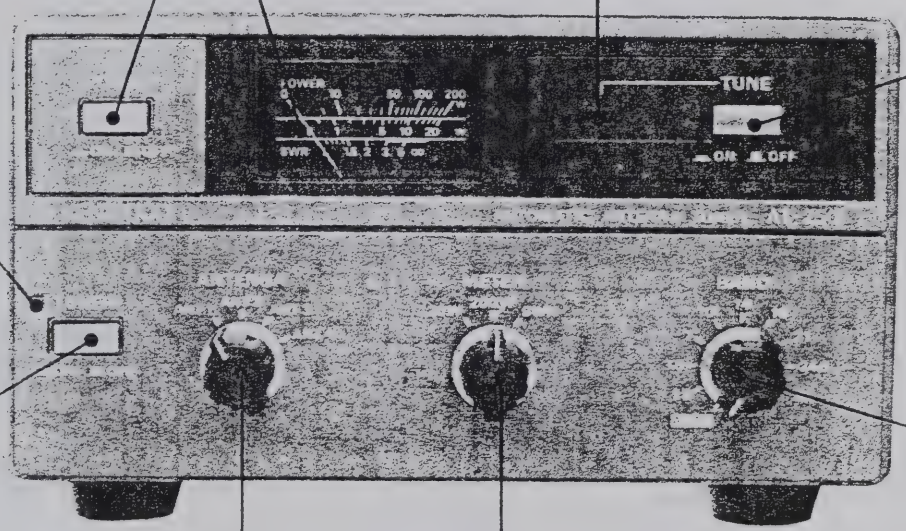
- **POWER switch**
Turns the AT-250 power ON-OFF. Before turning the switch ON or OFF, check that the TUNER switch and the TUNE switch are set to OFF.

- **POWER-SWR meter**
Indicates transmit power and SWR. The power scale has two readings, up to 20 W and up to 200 W, selected by the METER switch.

- **TUNE switch**
Used to activate the auto tuning function. With the TUNER switch ON, setting this switch to ON provides an SWR of less than 1.2:1. After auto-tuning is complete and the TUNE indicator goes off, set the switch to OFF and operate the transceiver. When operating the transceiver with this switch at ON, the motor may activate during operation. With the switch to ON, the receive signal does not pass through the antenna tuner even with the RX IN-OUT switch on the rear panel set to IN.

- **TUNER indicator**
Light ON: The signal passes through the antenna tuner.
Light OFF: The antenna tuner is through.

- **TUNE indicator**
Lights when auto tuning is in operation. Goes off when auto tuning is complete and the motor stops.



- **TUNER switch**
ON: Transmit signal passes through the antenna tuner. Receive signal depends on the RX IN-OUT switch setting (rear panel) and the TUNER switch setting.
OFF: The antenna tuner is "through" in all modes.

- **BAND switch**
Set to the desired ham band between 1.8 and 28 MHz, corresponding to the frequency to be used. With a TS-430 transceiver, set the switch to AUTO. The desired band setting is automatically selected by the TS-430.

- **ANTENNA switch**
Since 4 antennas can be connected to the unit, select the desired antenna when changing frequency or bands.

- **METER switch**
Used to select power or SWR indication. For power indication, 20 W or 200 W can be selected. For SWR indication, set the switch to SWR. No calibration is required, since this is an automatic instrument.

Remove the 6K8 tube grid cap. Connect a 1 megohm resistor between grid cap and grid of 6K8 tub connect the hot side of the signal generator to the grid of the 6K8 tube through a .1 MFD con Connect the ground terminal of the signal generator to the chassis of the receiver. Remove modu from generator and feed a 455 KC signal into the receiver and set the pitch control to give a be of approximately 1000 cycles. Adjust all I.F. transformer trimmers for maximum gain with the ex of the secondary trimmer on transformer T1. Identified on top chassis view as T1S. In adjusti trimmer it will be noted that the output reaches a maximum goes through a dip and then back to again. Wobbulate the IF frequency and align to the dip between the two maximum points. A distinct in the crystal note sounding like an apparent broadening of the crystal action will be noted wh correct adjustment has been reached. At this point in the alignment it is necessary to make an ment on the phasing control as follows: Tune the signal generator so that its signal will go t zero beat and then to the other side of zero beat until a signal of approximately 5000 cycles is h the speaker or headphones. Now carefully adjust the "PHASING CONTROL" until this signal is redu volume to a minimum. Reset the signal generator to its original frequency and recheck the adjustm T1S. Now repeak carefully the other trimmers on I.F. transformers for maximum gain. Place the tivity switch in the "CW. XTAL" position leaving all controls on the receiver as previously adj Again wobbulate the frequency of the signal generator carefully through the very narrow range crystal peak. Adjust small trimmer through hole in the bottom plate marked "TXS" until the sharp peak reaches maximum output. At this point the crystal is extremely sharp and maximum output is po If this setting gives too sharp crystal filter action this "TXS" trimmer can be adjusted counter- wise for broader crystal response to suit the operator.

B.F.O. ADJUSTMENT

In the center of the "PITCH CONTROL" shaft, after the knob has been removed, you will find a re screw for adjustment of the Beat Frequency Oscillator.

Before rotating this screw with a suitable screw-driver loosen the set screw on this shaft. Th screw can be reached through a hole in the bottom plate directly under the B.F.O. Assembly marked "

Now tune in a signal on the receiver with the BFO off. Exact resonance can be determined with th trols so adjusted that the "S" meter will indicate. After you have assured yourself that you ha signal properly tuned in place the selectivity switch in anyone of the three "AVC OFF" positions. the BFO switch to the "ON" position. You now can adjust the screw in the center of the pitch c shaft until a beat note is heard. Tighten the set screw through the bottom plate, replace the kn the BFO adjustment is completed.

R. F. ALIGNMENT

Re-connect the grid cap to the 6K8 tube. Connect the hot side of the generator to the A_1 antenna te on the rear of the chassis. Be sure a jumper is connected to A_2 and G. Leave signal generator connected to the chassis of the receiver.

The location of the following trimmers and padders can be determined by referring to the top and chassis views. All pad adjustments are for the low frequency end of each band while the trimmers a the high frequency ends.

In order to get at the RF trimmers the gusset cover card can be removed by placing a knife under the snap fasteners holding it in place. So that most satisfactory adjustment of the trimmers and padde be made, it is advisable to "Rock" the condenser gang across the signal being delivered by the gen until that particular circuit has been accurately peaked.

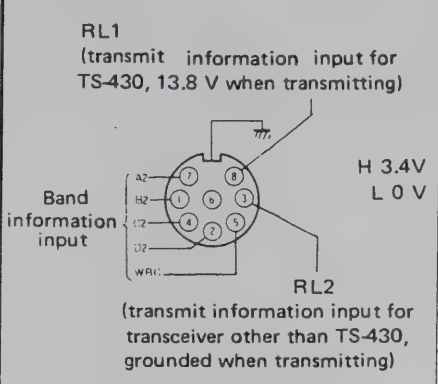
Bands	Trim at	Pad at
1	1500 KC Adjust C_A C_B C_C	600 KC Adjust Pad Band 1
2	4 MC Adjust C_D C_E C_F C_G	1.8 MC Adjust Pad Band 2 (Top Chassis)
3	14 MC Adjust C_H C_I C_J C_K	6 MC Adjust Pad Band 3
4	30 MC Adjust C_L C_M C_N C_O	18 MC No pad on this Band

• **DC/AC switch**
Used to select DC or AC power source. Be sure to set the switch to DC or AC, depending on the power source selected.

• **RX IN-OUT switch**
Before shipment, this switch is set to OUT, With this setting, only a transmit signal passes through the antenna tuner. With the switch set to IN, both transmit and receive signals pass through the antenna tuner.

• **ACC jack**
An input jack for controlling the AT-250. Using the control cable supplied, connect the transceiver to this jack.

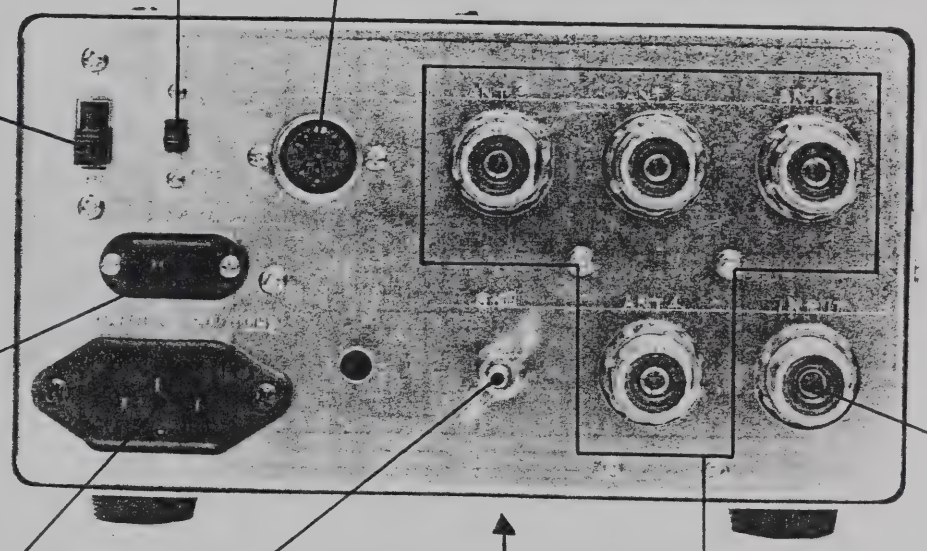
Detail of the AT-250 ACC terminal



View from unit inside

The following are band informations fed to the ACC jack.

Band	D 2	C 2	B 2	A 2	WRC
1.8	L(0)	L(0)	H(1)	L(0)	L(0)
3.5	L(0)	L(0)	H(1)	H(1)	L(0)
7	L(0)	H(1)	L(0)	H(1)	L(0)
10	L(0)	H(1)	H(1)	L(0)	H(1)
14	L(0)	H(1)	H(1)	H(1)	L(0)
18	H(1)	L(0)	L(0)	L(0)	H(1)
21	H(1)	L(0)	L(0)	L(0)	L(0)
24.5	H(1)	L(0)	L(0)	H(1)	H(1)
28	H(1)	L(0)	L(0)	H(1)	L(0)



• **AC power connector**
When AC power (120, 220 or 240 V selectable) is to be used, connect the supplied AC cable here.

• **POWER VOLTAGE SELECTOR switch**
With this switch, on the bottom panel, select your local line voltage.

• **INPUT jack**
Input jack for the antenna tuner. Connect the transceiver antenna jack to this INPUT jack.

• **DC power connector**
When DC power (13.8 V) is to be used, connect here.

• **GND terminal**
GND terminal for the AT-250. Connect the transceiver GND terminal to this terminal. Grounding the terminal prevents TVI and BCI.

• **ANT 1 – ANT 4 jacks**
Coaxial antenna jacks. Connect antennas corresponding to your operating frequency range.

1.	**Frequency range**	All amateur bands from 1.8 – 29.7 MHz
2.	**Input impedance**	50 ohms unbalanced
3.	**Output impedance**	20 – 150 ohms unbalanced
4.	**Insertion loss**	0.8 dB or less
5.	**Pass through power**	100W (200W PEP)
6.	**SWR value for motor stop**	1.2:1 or less
7.	**Min. power for activation**	3W
8.	**Max. tuning time**	Within 15 seconds
9.	**Power meter (peak value reading)**	± 10% at 100W (Meter Switch 200W Position) ± 10% at 10W (Meter Switch 20W Position)
10.	**Power consumption (current)**	15W AC 13.8V DC 600 mA
11.	**Power requirement**	120V, 220V, or 240V AC selectable 13.8V (12–16) DC
12.	**Dimensions**	W174 (174) x H96 (107) x D257 (289) mm ( ) shows projections included.
	Weight	4.2 kg (9.24 lb.)
13.	**Package dimensions**	W385 x H167 x D264 mm Capacitance: 0.017 m^3
14.	**Semiconductors**	ICs 13 FETs 2 Transistors 31 Diodes 77

ACCESSORIES

Remote cable (A) 1
Remote cable (B) 1
AC power cable 1
Grounding wire 1
Instruction manual 1

Specifications may be subject to change without notice for technical improvement.

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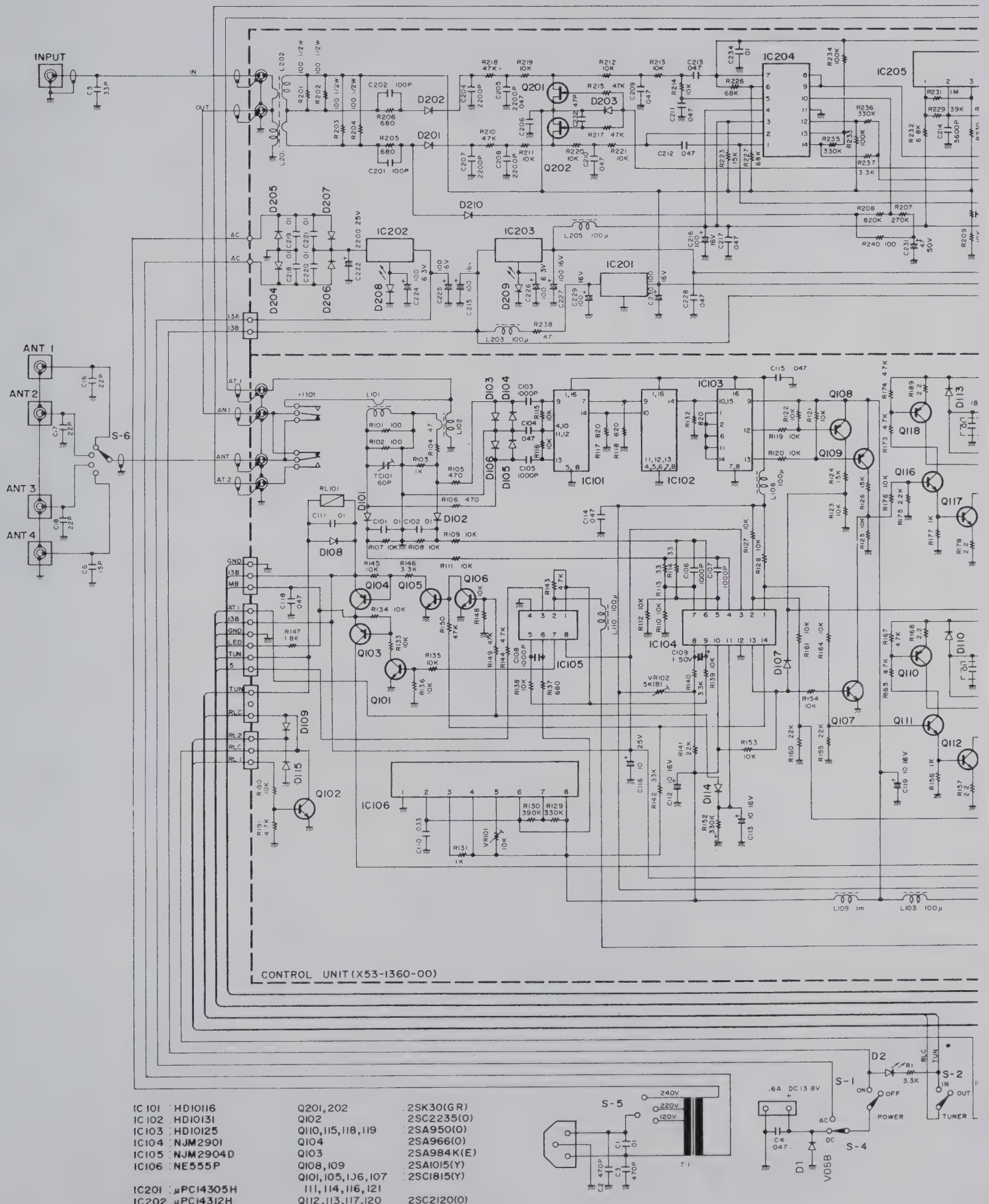
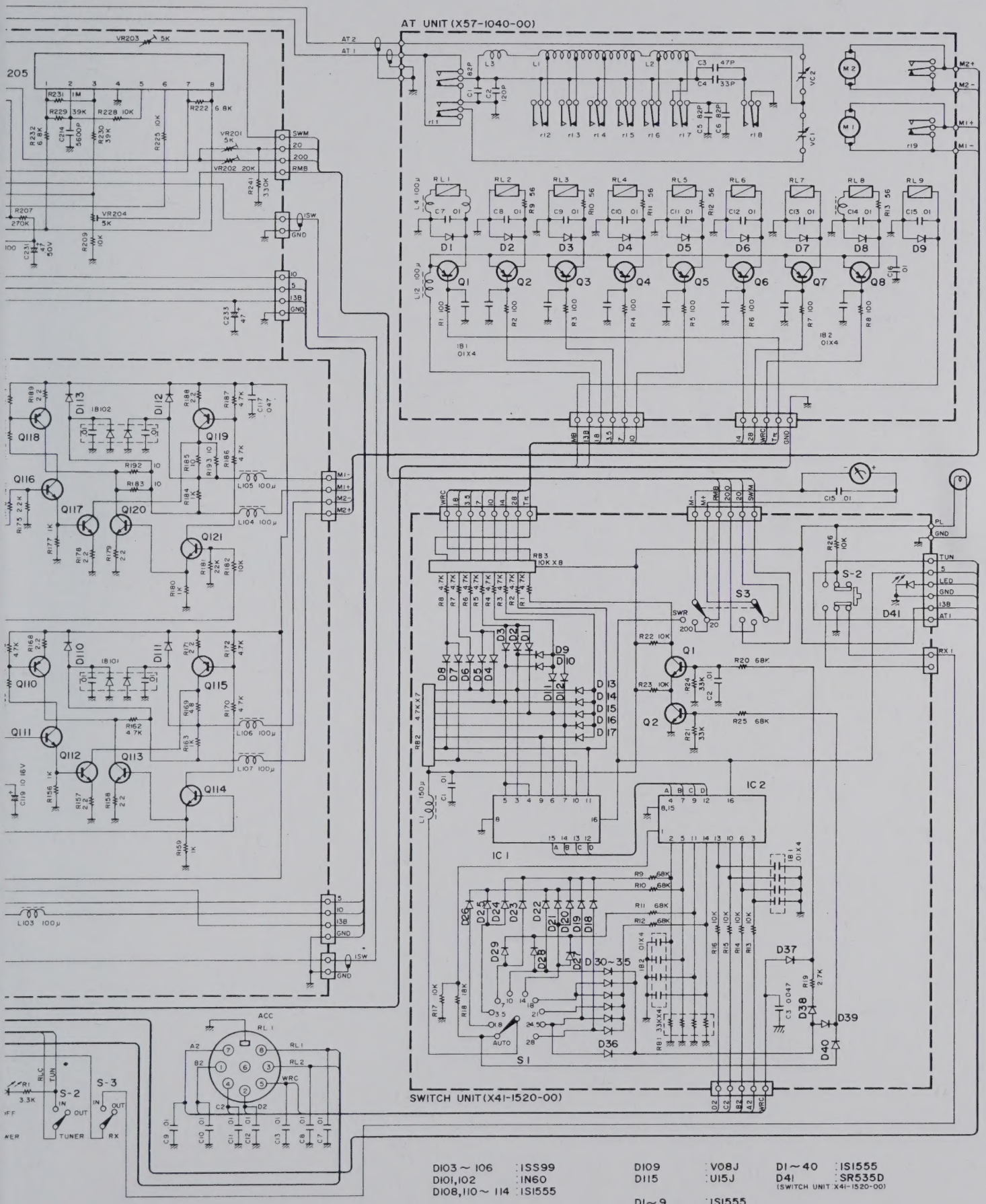
HEMATIC DIAGRAM



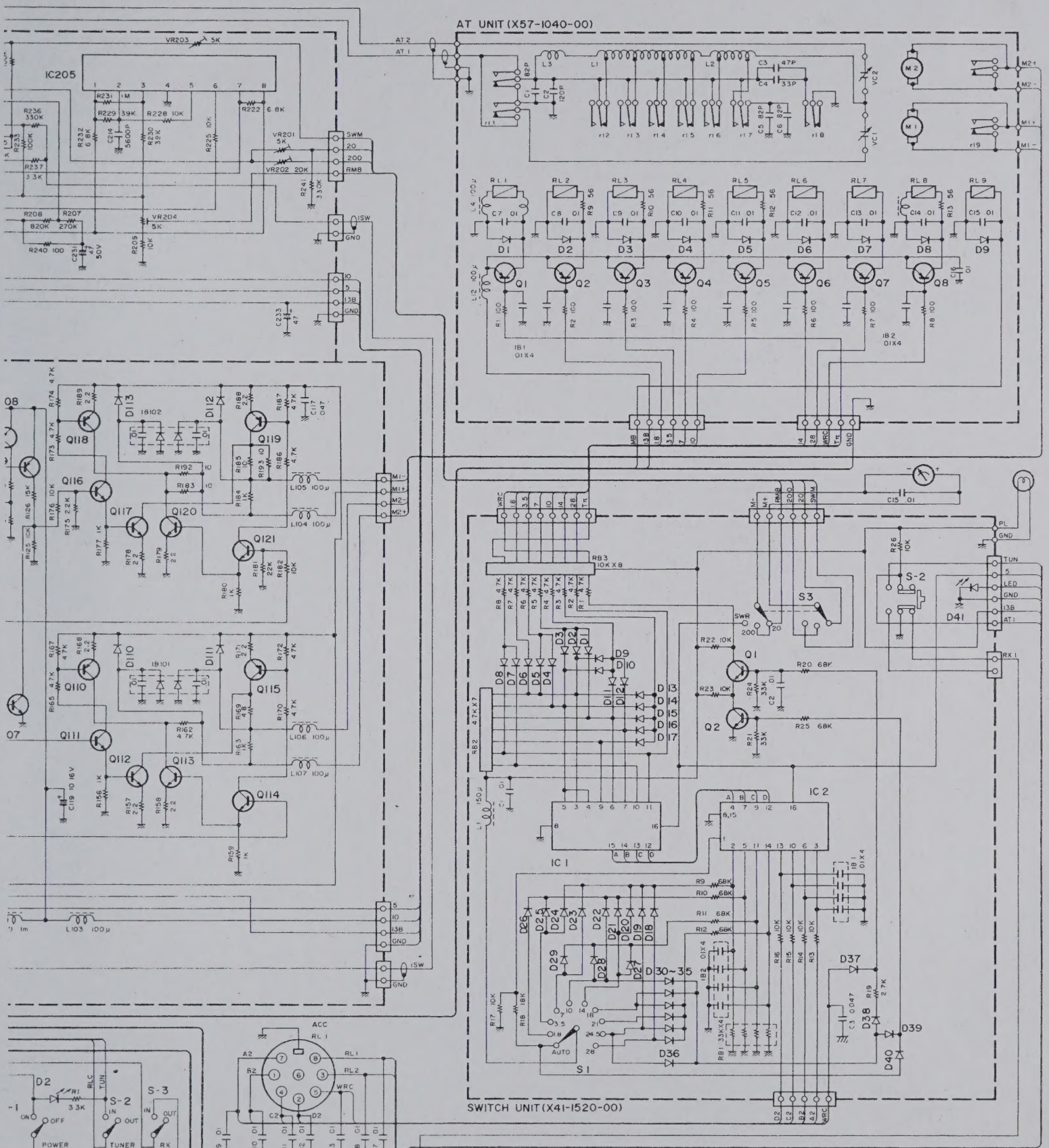
IC101 : HD10116	Q201, 202	: 2SK30(GR)
IC102 : HD10131	Q102	: 2SC2235(O)
IC103 : HD10125	Q110, 115, 118, 119	: 2SA950(O)
IC104 : NJM2901	Q104	: 2SA966(O)
IC105 : NJM2904D	Q103	: 2SA984K(E)
IC106 : NE555P	Q108, 109	: 2SA1015(Y)
	Q101, 105, 106, 107	: 2SC1815(Y)
IC201 : μPC14305H	111, 114, 116, 121	
IC202 : μPC14312H	Q112, 113, 117, 120	: 2SC2120(O)
IC203 : μPC78L08A		
IC204 : MB3614	Q1, 2	: 2SC1815(Y)
IC205 : NJM2903D		

Circuit may be subject to change without notice for improvement.



D103 ~ 106	:1SS99	D109	:V08J	D1 ~ 40	:1SI555
D101,102	:1N60	D115	:U15J	D41	:SR535D
D108,110 ~ 114	:1SI555			(SWITCH UNIT X41-1520-00)	
		D1 ~ 9	:1SI555		
D204 ~ 207	:V06C	(AT UNIT X57-1040-00)			
D208,209	:LT8001P				
D201,210	:1SI587				
D202	:1SI007				

Circuit may be subject to change without notice for improvement.



D103 ~ 106 : 1SS99
D101,102 : 1N60
D108,110 ~ 114 : 1S1555

D204 ~ 207 : V06C
D208,209 : LT8001P
D201,210 : 1S1587
D202 : 1S1007

D109 : V08J
D115 : U15J

D1 ~ 40 : 1S1555
D41 : SR535D (SWITCH UNIT X41-1520-00)

D1 ~ 9 : 1S1555 (AT UNIT X57-1040-00)

FREQUENCY METER TUNING

Around the outer edge of the main tuning dial the amateur bands for which "Frequency Meter Tuning available are marked with the red numerals; 10 - 20 - 40 and 80. Set the red line beneath these erals directly opposite the hair-line on the window and switch to the correct band. The band sp scale will indicate correct frequency within the limits of the accuracy of the setting and calibratio

The band spread dial of the SX25 Model is calibrated so that the operator may determine quite closely frequency of the signal to which he is listening on the 10 to 80 meter amateur bands inclusive. The er edge of this dial is marked off in 100 divisions for additional ease in logging and locating stati

Amateur Band	Set Band Switch at
80 Meter	Band 2
40 Meter	Band 3B
20 Meter	Band 3
10 Meter	Band 4

BAND 3B -- Special reference is called to this position of the Band Switch so that no confusion wil experienced. Band 3B is the same as Band 3 and is used in order to have the band spreading of th meter band accomplished through approximately the same number of degrees on the Band Spread Scale as cupied by the other amateur bands for which calibration appears. When the Band Switch is placed in p tion 3B another section of the band spread condenser is paralleled in the circuit. Band 3 main s calibration will read somewhat high when the Band Switch is set on 3B.

TUBE LINE-UP

6SK7	1st RF Amplifier	6SQ7	Phase Inverter
6SK7	2 R.F. Amplifier	PP-6F6	2nd audio output stage
6K8	1st Detector-Mixer H.F. Oscillator	6H6	Automatic Noise Limiter
6SK7	1st I.F. Amplifier	6J5GT	Beat Frequency Oscillator
6SK7	2nd I.F. Amplifier	80	Rectifier
6SQ7	2nd Detector, A.V.C. 1st stage of audio		

CONTROLS AND OPERATION

Reading from left to right the functions of the various identified controls will be described.

The "R.F. Gain" control adjusts the sensitivity of the receiver by varying the cathode bias on the and I.F. amplifiers. Maximum sensitivity will be obtained when this control is rotated as far as it go to the right. When this has been done a switch will operate which lights the lamp behind the brated "S" meter to be described in greater detail later.

The "Band Switch" will allow selection of the frequency ranges through which the receiver tunes. previously mentioned, Band 3B is to be used when band spreading the amateur 40 meter band.

The "Selectivity - A.V.C. Switch" provides a means of bringing the signal through varying condition interference.

When using the receiver for the reception of modulated, or telephone, signals it is advisable to hav switch in anyone of the three "A.V.C. on" positions at which reception is most satisfactory. The steps of selectivity, namely: BROAD I.F., SHARP I.F., PHONE CRYSTAL, will provide control of select sufficient to meet all normal receiving requirements.

For code or C.W. reception, the Automatic Volume Control circuit should be disconnected by placin selectivity switch in anyone of the 3 "A.V.C. off" positions. When this has been done the R.F. Gain trol should be manually adjusted so that the set will not overload or block on extremely strong sig The maximum selectivity of the receiver is obtainable with the selectivity switch in the "C.W. position. The received signal will be considerably sharper and as a result more care should be exer in tuning when the C.W. crystal is in the circuit. Careful design of the filter circuit results i proved crystal filter action in the SUPER Defiant which will allow the use of the set under othe trying conditions of reception. The phasing control should be adjusted so that the signal on one si zero beat is reduced in intensity as much as possible. Now carefully tune through the desired signa notice the distinct increase in signal strength as the resonant frequency of the crystal is rea Actually the increase in gain in the "CW. CRYSTAL" position of the selectivity switch is from 2.5 times more than any other setting of the selectivity control. In addition the PHASING control, properly adjusted, will prove helpful in coping with conditions of extreme interference. Adjustme this control for maximum rejection of the unwanted signal, or audio image, will allow true single-s reception. With the Selectivity Switch in all other positions but C.W. xtal, and "fone xtal" the s of the phasing control will have no effect on the received signal.